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TECHNICAL NOTES

LAKE STATES FOREST EXPERIMENT STATION U.S. DEPARTMENT OF AGRICULTURE · · FOREST SERVICE

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Weather Station Records Not an Accurate Guide to Temperatures Lethal to the Shoot Moth

That overwintering larvae of the European pine shoot moth (*Rhyacionia buoliana* (Schiff.)) are unable to withstand temperatures below -18° F. has been proved fairly conclusively. Yet in the past few years this insect has become a serious problem in plantations located between Cadillac and Lake Michigan, although temperatures below -18° were reported in 1952, 1953, and 1954 at the official weather station at Cadillac, Mich.

In 1952-53 experiments were conducted to investigate the possibility of cold hardiness of the larvae in the Cadillac area. The laboratory results proved that -18° is a true minimum threshold and that the Cadillac population did not exhibit any cold hardiness.

The infested plantations are located approximately 20 miles west of Cadillac and 20 miles east of Lake Michigan. On the supposition that the actual minimum temperatures within the plantations are higher than those recorded at Cadillac, the minimum monthly temperatures and the average minimum daily temperatures for a 5-year period for Manistee (on Lake Michigan) and Cadillac were plotted to determine the tempering influence of Lake Michigan (figure 1 on back of sheet). Analysis of the data shows that the monthly minimum at Cadillac averaged 15.5° ($\pm 5.9^{\circ}$) lower than that recorded at Manistee. Also the average daily minimum at Cadillac was 6.5° ($\pm 2.4^{\circ}$) lower than at Manistee. The greatest difference occurred from December through April, the most important period in causing mortality of overwintering shoot moth larvae.

The minimum monthly temperature for January through March at Cadillac averaged below -10° ; the minimum monthly temperature for Manistee does not normally go below 0° for the same period. Based on the plotted data, the temperature curve within the plantation area could be represented empirically by points located approximately midway between the Cadillac and Manistee curves. This would mean that a low of about -5° could be expected in the plantation area--well above the lethal -18° threshold. This was substantiated by limited field observations during 1954-56. Minimum temperature thermometers placed at various heights and points within infested plantations recorded lows of -6° and -5° in 1955 and 1956 respectively. Pre- and post-winter larval collections were made during this 3-year period to determine the degree of mortality. No significant over-wintering mortality occurred.

It therefore seems doubtful if spread of the European pine shoot moth in the study area will be limited by low winter temperatures. Temperatures rarely reach the low threshold for larval mortality, and they probably are further moderated by the surrounding trees and snow accumulation.

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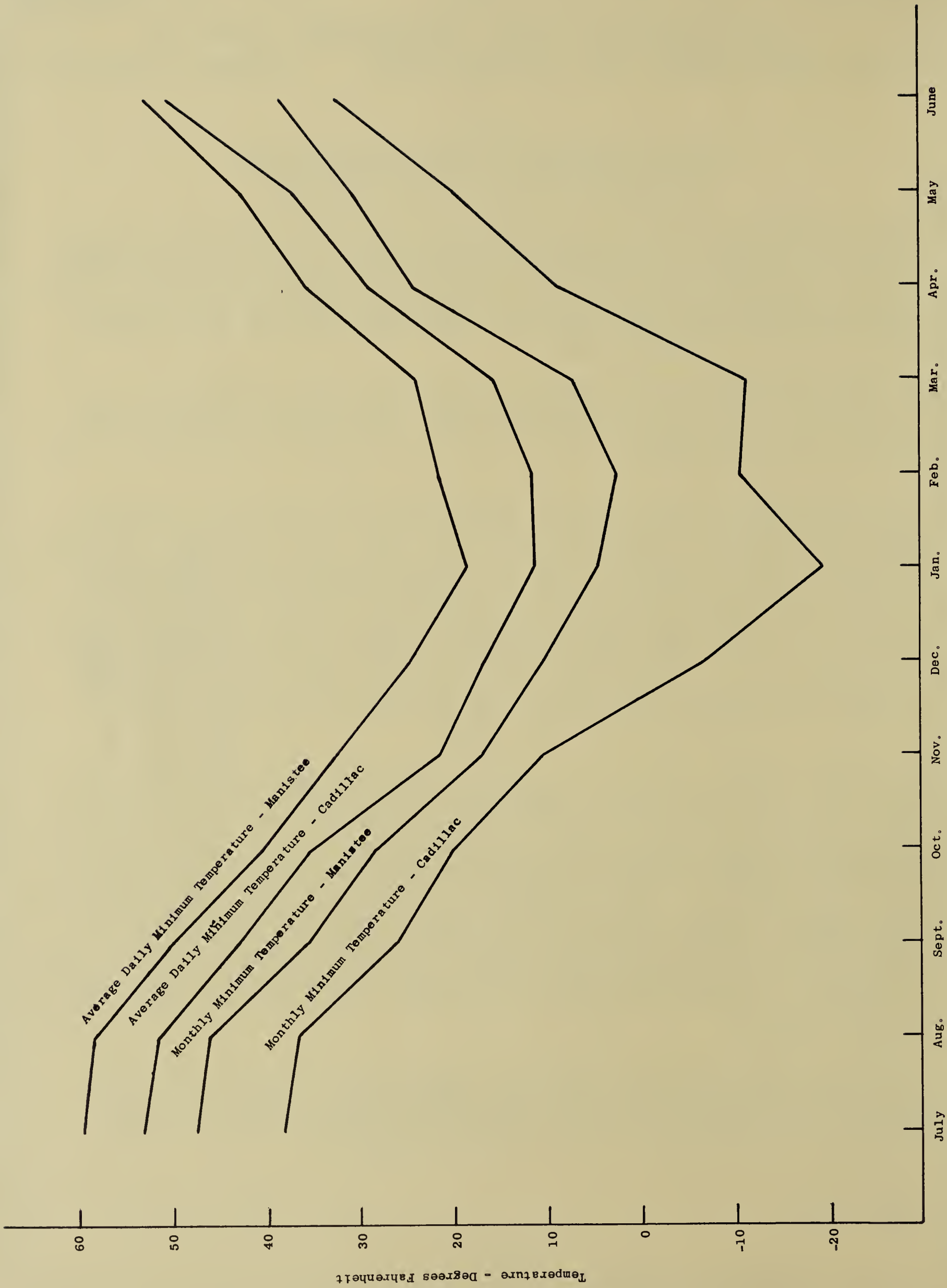


Fig. 1.--Five-year temperature records at Cadillac and Manistee, Mich.